

REMARKS

Claims 25-48 are pending. Claim 48 has been objected to. Claims 25-48 have been rejected under 35 U.S.C. §112, second paragraph. Claims 25-48 have been rejected under 35 U.S.C. §103. Claims 25 and 48 have been amended. Support for the substantive amendments to claims 25 and 48 are found at least in claim 26. Claims 1-24 have been cancelled in previous correspondence. Claim 26 has been cancelled herein without prejudice. Claims 25 and 27-48 remain for consideration upon entry of the present Amendment. No new matter has been added.

The Examiner has objected to the drawings as not showing every feature described within the specification and the relationships therein.

Applicants have reviewed the alleged informalities with regard to the drawings as pointed out by the Examiner and enclose Replacement Drawing Sheets for pages 3, 5, and 6 of the drawings. In these Replacement Sheets, reference numbers are added to indicate the upper edge 33, the lower edge 34, and the wave peaks 38 in Figures 6 and 8, and the fuel unit 20 in Figure 3. Accordingly, Applicants respectfully request that the Examiner withdraw the objections to the drawings.

The Examiner has objected to the specification due to various informalities.

Applicants have reviewed the alleged informalities as pointed out by the Examiner and have made a thorough review of the drawings and specification as requested by the Examiner. Applicants believe that the amendments to the drawings as indicated on the Replacement Drawing Sheets address the Examiner's objections to the drawings and to the specification. Accordingly, Applicants respectfully request that the Examiner withdraw the objections to the specification.

In accordance with 37 C.F.R. §1.125(b), Applicants herewith state that the substitute specification filed on July 12, 2006, does not contain any new matter.

Claim 48 has been objected to because of the phrase "s number." This informality has been corrected in the amended claim 48. Applicants therefore respectfully request that the Examiner withdraw the objection to claim 48.

Claims 25-47 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as the invention.

Claim 25 has been rejected as allegedly being indefinite because the term “sleeve-like” is a relative term. The term “sleeve-like” has been removed from claim 25. Applicants therefore respectfully request that the Examiner withdraw the rejection of claim 25 based on these grounds.

Claim 25 has also been rejected as allegedly being indefinite because the limitation “the sheet-shaped material” lacks antecedent basis. In the amended claim 25, Applicants have provided antecedent basis for “the sheet-shaped material.” Applicants therefore respectfully request that the Examiner withdraw the rejection of claim 25 based on these grounds.

Claim 25 is has further been rejected as allegedly being indefinite because the limitation “said bending” lacks antecedent basis. Applicants have provided antecedent basis for the limitation “said bending” in the amended claim 25. Applicants therefore respectfully request that the Examiner withdraw the rejection of claim 25 based on these grounds.

Claim 26 has been rejected as allegedly being indefinite because the limitations “the first connection portion” and “the second connection portion” have not been introduced as components in the final product. The subject matter of claim 26 has been incorporated into claim 25, the alleged deficiencies noted by the Examiner have been addressed, and claim 26 has been cancelled, thereby rendering the Examiner’s rejection of claim 26 moot. Applicants, therefore, respectfully request that the Examiner withdraw the rejection of claim 26.

Claim 48 has been rejected as allegedly being indefinite because the term “sleeve-like” is a relative term. The term “sleeve-like” has been removed from claim 48. Applicants therefore respectfully request that the Examiner withdraw the rejection of claim 48 based on these grounds.

Claim 48 has been rejected as allegedly being indefinite because the limitation “the sheet-shaped material” lacks antecedent basis. In the amended claim 48, Applicants have provided antecedent basis for “the sheet-shaped material.” Applicants therefore respectfully request that the Examiner withdraw the rejection of claim 48 based on these grounds.

Claim 48 has been rejected as allegedly being indefinite because the limitation “said bending” lacks antecedent basis. Applicants have provided antecedent basis for the limitation “said bending” in the amended claim 48. Applicants therefore respectfully request that the Examiner withdraw the rejection of claim 48 based on these grounds.

In view of the amendments to claims 25 and 48 and the Examiner's rejections of claims 26-47 as being dependent upon claim 25 (claim 26 has been cancelled as indicated above), Applicants respectfully request that the Examiner withdraw the rejections of claims 25-47 based on 35 U.S.C. §112, second paragraph.

In view of the amendments to claim 48, Applicants respectfully request that the Examiner withdraw the rejection of claim 48 based on 35 U.S.C. §112, second paragraph.

Claims 25-27, 31-40, and 48 have been rejected under 35 U.S.C. §103(a) as allegedly being obvious over U.S. Patent No. 5,875,223 to Nylund (hereinafter "Nylund") in view of U.S. Patent No. 4,172,761 to Raven et al. (hereinafter "Raven"). With regard to claim 25, the Examiner notes that Nylund does not necessarily disclose "each sleeve-like member being manufactured from a sheet-shaped material that is bent to the sleeve-like shape, and wherein the sheet-shaped material before said bending has a first connection portion in the proximity of a first end of the sheet-shaped material and a second connection portion in the proximity of a second end of the sheet-shaped material, wherein the first end overlaps the second end of the sleeve-like member after the bending." The Examiner then alleges that it would have been obvious to one of ordinary skill in the art to include this limitation in view of Raven, who teaches the sleeve member being made from a strip metal blank which is deformed to produce a sleeve with overlapping ends for connecting by brazing or welding. The Examiner also alleges that the manufacture of the sleeve-like member itself represents a product-by-process limitation.

Nylund discloses a spacer for retaining and positioning elongated elements in a nuclear reactor fuel assembly. This spacer comprises a grid structure of sleeve cells that are joined together. An upstream edge of the spacer is designed with a wavy form such that the part of the upstream edge encounters upward flowing coolant after the coolant has encountered the edge between the joints. In this manner, any foreign matter is oriented such that it is arranged between the elongated elements transversely of the flow direction. Accordingly, the foreign matter will contact a part of the wavy edge disposed at the joint with adjacently located sleeves in the grid structure and diagonally across the flow channel formed between the sleeves in an orthogonal grid structure, thus as far away from the surfaces of the fuel rods located in the spacers as possible.

Nylund fails to disclose, teach, or suggest a spacer that encloses a plurality of sleeves, each of which form a cell and each comprising a sheet-shaped material formed into a

substantially cylindrical shape, the sheet-shaped material comprising a first connection portion in the proximity of a first end and a second connection portion in the proximity of a second end, the first end overlapping the second end, the portions being permanently connected to each other by means of at least one weld joint, as recited in claim 25. With regard to claim 48, Nylund fails to disclose, teach, or suggest a fuel unit for a nuclear plant comprising a number of such spacers.

In contrast to Nylund, the spacer of claim 25 (and the spacers of the fuel unit of claim 48) comprises sheet-shaped material formed into a substantially cylindrical shape that allows for the maintaining of a plurality of fuel rods in a fuel assembly in a nuclear plant, whereas the Nylund spacer is non-cylindrical as defined by oblique edges that form an angle with the axial direction of the spacer.

In addition, the spacer of claim 25 is easily manufactured using a small quantity of material, i.e., a thin material, formed into a cylindrically-shaped sleeve capable of withstanding large thermal and hydraulic forces and one that is also designed to absorb axial and radial dimension changes of the fuel rods. The thinness of the material also minimizes the neutron absorption of the spacer and provides for a low flow resistance in the coolant flowing through the fuel assembly during operation of the nuclear plant. This is different from Nylund because Nylund relies on the thickness of the sleeve cells to promote contact with foreign matter. The formation of a thin material into a cylindrically-shaped sleeve is the opposite of a spacer formed with a wavy edge arranged transversely across a flow path for the purpose of contacting foreign matter. The ease of manufacturing allows for the sheet-shaped material to be provided to the desired dimension in a relatively easy cutting operation from a larger sheet of material.

The cut thin sheet-shaped material also allows the end portions of the material of the sleeve to be overlapped. The overlapping end portions permit the provision of a very strong joint between the end portions. The overlapping end portions are welded to each other in a later step before or even after mounting of the sleeve to a spacer. Both the overlapping and the welding are features that are absent from Nylund. One technical advantage of the overlapping of the ends of the sheet-shaped material is that the sleeve may be made using the very thin material while still permitting secure joining of the end portions to each other. Consequently, a spacer with such a sleeve will have a low flow resistance and will result in a low neutron absorption. A further technical advantage of the overlapping ends of the sheet-shaped material is that it is relatively easy to provide sleeves with different dimensions. It is to be noted that each spacer in

a fuel assembly can have cells of varying dimensions. Due at least in part to the overlapping design, sleeves with different dimensions may be made from one and the same sheet-shaped material, i.e., it is not necessary to provide a sheet-shaped material with varying sizes, e.g., varying lengths, in order to provide sleeves with varying diameters.

The above features clearly distinguish the invention as recited in claims 25 and 48 from Nylund.

The Examiner also alleges that Raven discloses the sleeve member (ferrules) made from a strip metal blank that is deformed to produce a sleeve with overlapping ends for connecting by brazing or welding.

Raven discloses a ferrule-type nuclear reactor fuel grid having adjacently-positioned cells for accommodating respective fuel rods. Each ferrule defines two cells formed from a single piece of metal strip. A dividing partition between the two cells may be a part of the single piece of the metal strip, or it may be a separate piece of metal strip. In one embodiment as shown in FIGS. 3-5 of Raven, the twin-celled ferrule is made from a strip metal blank which is substantially uniform in width but has an integral portion at one end which constitutes the partition about three times the uniform width. The blank from which the partition is made includes end tags. The partition is secured in position by passing these end tags through slots in the strip and folding the tags down flat. The partition is also held in place by a re-entrant fold made in the strip metal blank. In another embodiment as shown in FIGS. 6-8 of Raven, the ends of the metal strip overlap and are joined by a tag and slot configuration, and a separate strip forms the partition between the cells and is fixed in position by being brazed into the strip defining the cells.

Raven fails to disclose, teach, or suggest a spacer that encloses a plurality of sleeves, each of which form a cell and each comprising a sheet-shaped material formed into a substantially cylindrical shape, the sheet-shaped material comprising a first connection portion in the proximity of a first end and a second connection portion in the proximity of a second end, the first end overlapping the second end, the portions being permanently connected to each other by means of at least one weld joint, as recited in claim 25. With regard to claim 48, Nylund fails to disclose, teach, or suggest a fuel unit for a nuclear plant comprising a number of such spacers. More specifically, Raven fails to disclose the ends of the material forming the sleeve connected to each other via a weld joint. The end portions of the thin metal plate forming the sleeve of the

present invention are not joined together in the same way as the joining of the thin metal plate forming the double sleeve in Raven. According to an embodiment of Raven, one end of the metal plate is joined together with a first intermediate portion of the metal plate and the other end of the metal plate is joined together with a second intermediate portion of the metal plate. It is not the actual two end portions that are joined together, unlike the sleeve as recited in claim 25 (or in claim 48) where the first end portion is joined together with the second end portion by overlapping the end portions. The end portions of the metal plate of Raven are joined together with the intermediate portions of the metal plate by running a tag through a slot and then bending the tag. According to another embodiment of Raven, the first end portion of the metal plate is joined together with the second end portion of the metal plate by running a tag through a slot and then bending the tag. However, to form the two sleeves, a separate dividing wall must be attached to the metal plate by welding or brazing. Accordingly, welding or brazing is only described as being used when a separate dividing wall is used together with the thin metal plate.

Furthermore, the sleeves of Raven are not initially complete and functional with respect to the construction of the thin metal plate. For example, the dimples 10 will form fuel rod-engaging stops (after being appropriately bent). However, a double sided bow spring 7 is required on the dividing wall between the two sleeves. This bow spring 7 presses the fuel rods against the dimples 10 so that the fuel rods are held firmly in place in the sleeves. The thin metal plate of the present invention comprises dimples 35, the dimples 35 forming four protruding fuel rod stops when the thin metal plate has been formed into a sleeve. No additional spring is needed and consequently the thin metal plate of the present invention initially comprises all required elements. As described above, the thin metal plate of Raven is not initially complete since the dividing wall and/or the bow spring is/are additionally required to render the sleeves fully functional. Moreover, since in Raven the sleeves are formed into double sleeves, small diameter spacers 5 are needed to fill out the gaps formed between the sleeves in the spacer. This problem will not occur in the placement of the single sleeves recited in claims 25 and 48.

Because both Nylund and Raven fail to disclose the same thing individually, namely, spacers (and fuel units comprising such spacers) wherein each spacer encloses a plurality of sleeves, each of which form a cell and each comprising a sheet-shaped material formed into a substantially cylindrical shape, the sheet-shaped material comprising a first connection portion in the proximity of a first end and a second connection portion in the proximity of a second end, the

first end overlapping the second end, the portions being permanently connected to each other by means of at least one weld joint, both Nylund and Raven in combination necessarily fail to disclose such spacers.

Because both Nylund and Raven, individually and in combination, fail to disclose, teach, or suggest what Applicants recite in their amended claims 25 and 48, namely, spacers (and fuel units comprising such spacers) wherein each spacer encloses a plurality of sleeves, each of which form a cell and each comprising a sheet-shaped material formed into a substantially cylindrical shape, the sheet-shaped material comprising a first connection portion in the proximity of a first end and a second connection portion in the proximity of a second end, the first end overlapping the second end, the portions being permanently connected to each other by means of at least one weld joint, both Nylund and Raven, individually and in combination fail to teach all of the claim recitations of Applicants' invention. Consequently, because not all of the claim recitations are taught by the cited references, individually and in combination, Applicants' amended claims 25 and 48 are necessarily non-obvious, and Applicants respectfully request that the Examiner withdraw the rejections of claims 25 and 48.

Claims 28-30 and 41-47 have also been rejected under 35 U.S.C. §103(a) as allegedly being obvious over Nylund in view of Raven and further in view of U.S. Patent No. 6,608,881 to Oh et al. (hereinafter "Oh").

Because claims 28-30 and 41-47 all depend from claim 25, and because claim 25 is asserted to be non-obvious for the reasons presented above, claims 28-30 and 41-47 are necessarily non-obvious. Applicants, therefore, respectfully submit that claims 28-30 and 41-47 are allowable. Accordingly, Applicants respectfully request that the rejections of claims 28-30 and 41-47 be withdrawn.

Applicants believe that the foregoing amendments and remarks are fully responsive to the Office Action and that the claims herein are allowable. An early action to that effect is earnestly solicited.

If the Examiner believes that a telephone conference with Applicants' attorneys would be advantageous to the disposition of this case, the Examiner is invited to telephone the undersigned.

Applicants believe that no fees are due with the submission of this Amendment. If any charges are incurred with respect to this Amendment, they may be charged to Deposit Account No. 503342 maintained by Applicants' attorneys.

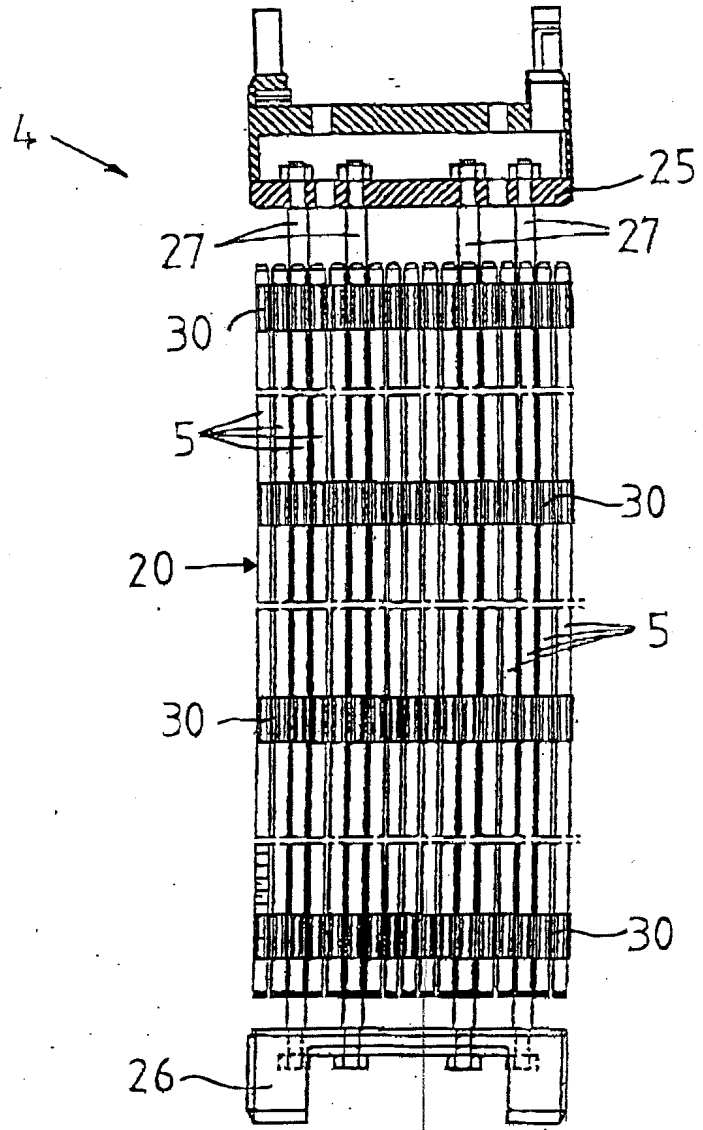
Respectfully submitted,

By /Richard R. Michaud/
Richard R. Michaud
Registration No. 40,008
Attorney for Applicants

Michaud-Duffy Group LLP
CenterPoint
306 Industrial Park Road
Suite 206
Middletown, CT 06457-1532
Tel: (860) 632-7200
Fax: (860) 632-8269

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Fig 3



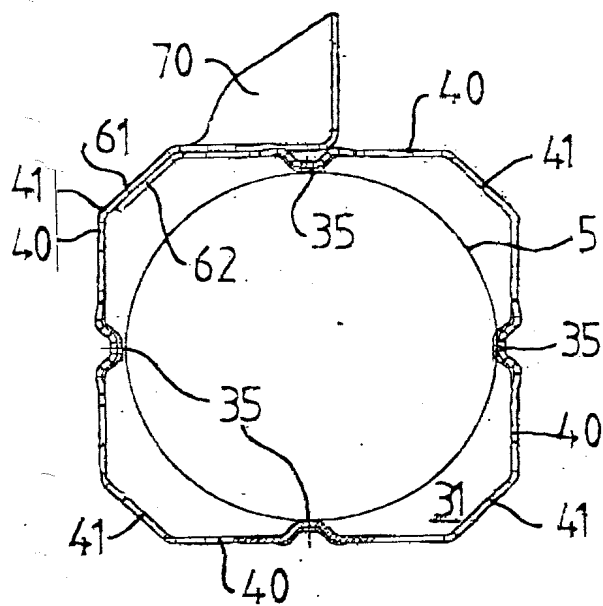
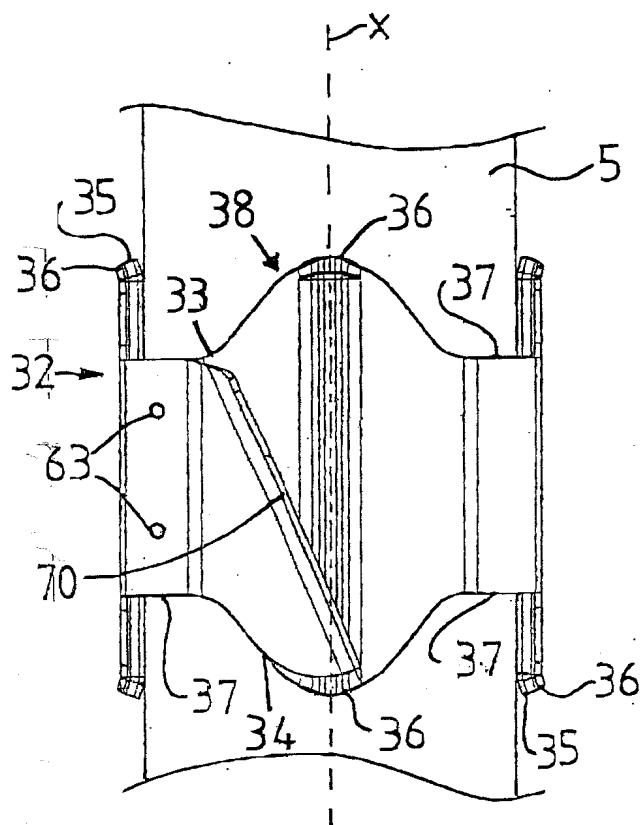


Fig 8

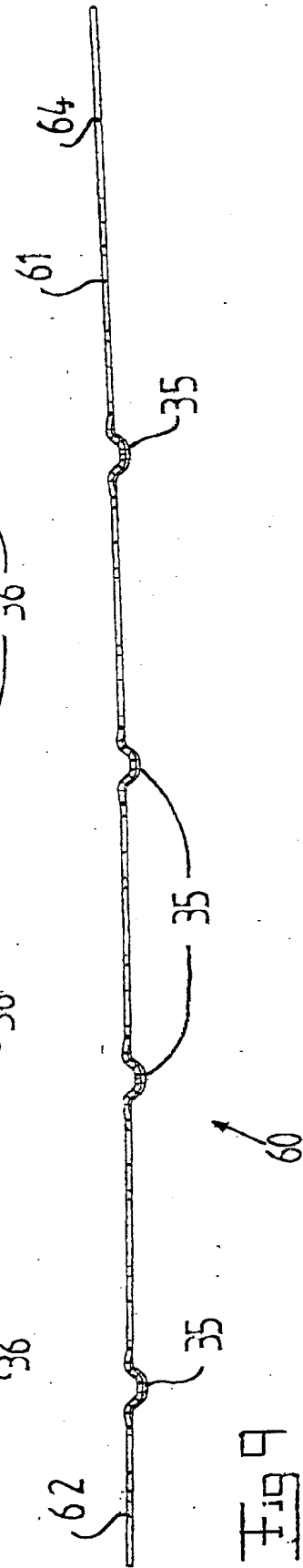
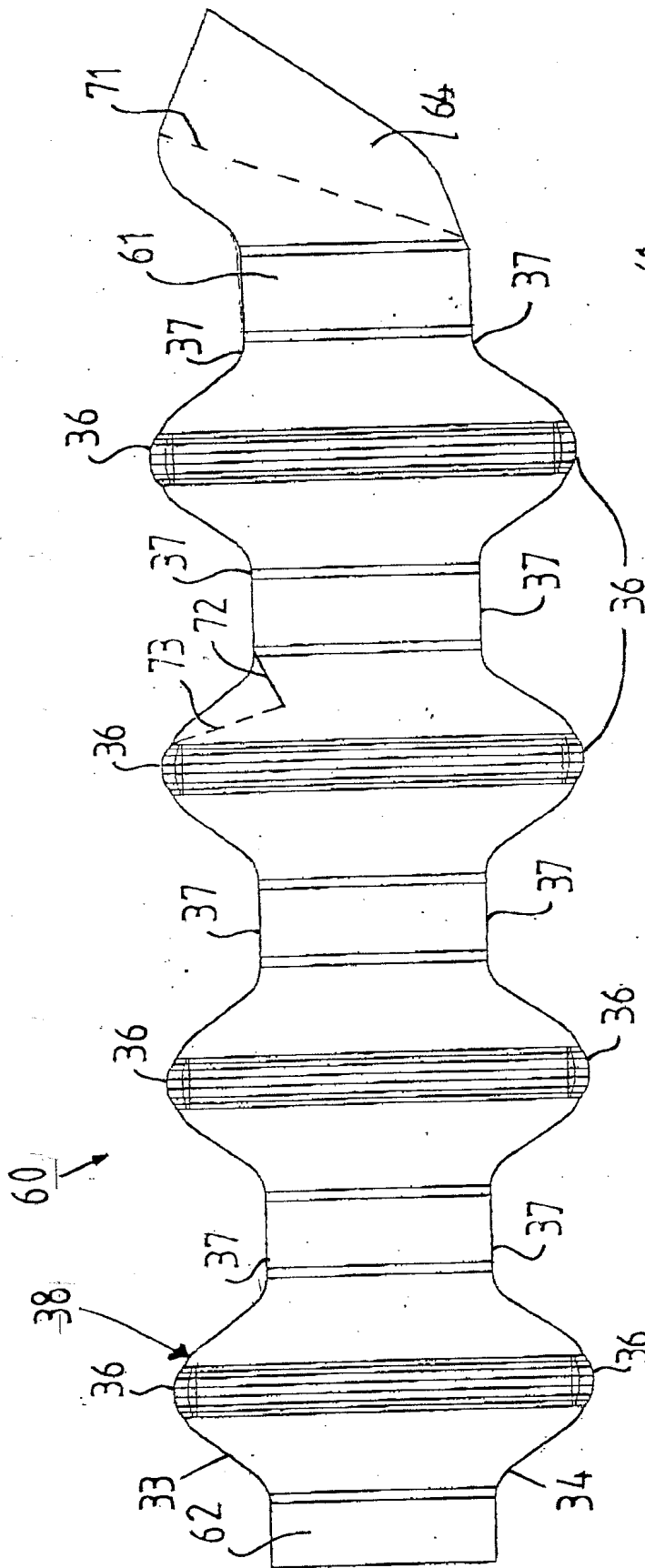


Fig 9